Synergistic Effect on the Electrochemical Performances of Polypyrrole Nanoparticles Distributed on the Graphene Layers as an Electrodes for Supercapacitors

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doi: 10.20964/2019.07.74

Received: 15 October 2018 / Accepted: 9 May 2019 / Published: 10 June 2019

The polypyrrole (PPy) nanoparticles distributed on the graphene layers are prepared via *in-situ* polymerization method. The amount of PPy on the graphene layers is varied in order to obtain the highest electrochemical performances. The PPy in graphene/PPy refers to nanoparticles with a diameter size of 0.19 μm . The graphene/PPy exhibited excellent electrochemical performances when 80 wt.% of PPy was added into the composite, with specific capacitance of approximately 270 F g^{-1} at a current density of 500 mA g^{-1} . Furthermore, 77% of initial capacitance was retained after 1000 charge/discharge cycles, which suggests good cycling stability of the composite at a current density of 5000 mA g^{-1} . The improved electrochemical performances of the composite are attributable to the synergistic effect of the PPy nanoparticles and crumpled graphene layers, which gave large surface area, short ion diffusion pathway, excellent rate performance, and cycling stability.

Keywords: supercapacitor; graphene; polypyrrole; synergistic effect; capacitance

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